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## Oribatid Mites (Arachnida: Acari: Oribatida) from the Marine Littoral of the Ryukyu Archipelago, Southwestern Japan

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A new genus, three new species, and three known species of oribatid mite are described from the marine littoral of the Ryukyu Archipelago, southwestern Japan. These taxa are *Arotrobates granulatus* Luxton, 1992, *Rhizophobates shimojanai* gen. nov. and sp. nov., *Schusteria nagisa* sp. nov., *S. saxea* sp. nov., *Alismobates reticulatus* Luxton, 1992, and *Fortuynia rotunda* Marshall and Pugh, 2002. Two African species of the genus *Schusteria*, *S. melanomerus* Marshall and Pugh, 2000 and *S. ugraseni* Marshall and Pugh, 2000, are transferred to the new genus *Rhizophobates*.

**Key Words:** Acari, Fortuyniidae, Selenoribatidae, marine littoral, new genus, new species, Oribatida, Ryukyu Archipelago.

### Introduction

The members of the superfamily Ameronothroidea are known as exceptional oribatid mites in that their habitats include the marine littoral zone. In tropical and subtropical areas they are represented by the families Selenoribatidae and Fortuyniidae (Luxton 1992). At present, Selenoribatidae is composed of five genera, *Arotrobates*, *Psednobates*, *Schusteria*, *Selenoribates*, and *Thalassozetes*; Fortuyniidae includes three genera, *Alismobates*, *Circellobates*, and *Fortuynia* (Luxton 1992). However, only a single oribatid subspecies, *Fortuynia elamellata shibai* Aoki, 1974, has been recorded from the marine littoral of Japan (Aoki 1974). In the present study we describe a new genus, three new species, and three known species of oribatid mite from the marine littoral of the Ryukyu Archipelago, extending southwest of the main islands of Japan.

Morphological terminology used in this study follows that developed by F. Grandjean (Travé *et al.* 1996).

### Taxonomy

Family **Selenoribatidae** Schuster, 1963

[Japanese name: Mangetsudani-ka]

Genus **Arotrobates** Luxton, 1992

[Japanese name: Higata-norodani-zoku]

Type species: *Arotrobates lanceolatus* Luxton, 1992.

***Arotrobates granulatus*** Luxton, 1992

[Japanese name: Higata-norodani]

(Fig. 1A–C)

*Arotrobates granulatus* Luxton, 1992: 215, fig. 3A–B.

**Specimens examined.** One ♂, Haemida-no-hama, Iriomote Is., Okinawa Pref., 10-V-2002, S. Karasawa leg., from algae on rocks in littoral zone; 1♂, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 11-X-2001, S. Karasawa leg., from bark of knee roots of *Bruguiera gymnorrhiza* (L.) Lam.; 1♀, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 22-I-2003, S. Karasawa leg., from algae on floor of mangrove forest. All specimens (RUMF-ZA 01000–01002) are deposited in the University Museum, University of the Ryukyus, Okinawa.

**Measurements.** Body length of male 315–335 µm, notogastral width 196–202 µm (n=2); body length of female 323 µm, notogastral width 200 µm (n=1).

**Description.** *Prodorsum.* Prodorsum covered with small granules, with transverse ridge separating off rostrum. Pair of faint ridges in middle part of prodorsum. Rostral setae minute, 2–3 µm long, inserted at tip of rostrum. Lamellar setae not seen. Interlamellar setae reduced to alveoli. Bothridium conspicuous, with long ridge extending posteriorly from its base. Sensillus clavate, capitulum elongate and barbed.

*Notogaster.* Widest part found rather posteriorly. Dorsosejugal suture protruding. Light spot present anteromedially. Surface covered with conspicuous granules. Notogastral setae in 13 pairs, fine and inconspicuous, less than 11 µm long, but each with conspicuous alveolus; setae  $h_1$  not seen. Lyrifissures *im* situated between setae *la* and *lm*.

*Ventral side.* Overall very finely punctate. Characteristic carina running longitudinally over epimera expressed as four faint, interrupted lines on each side. Setal formula of epimera 1-0-1-1; setae *1b* 24–30 µm long, much longer than *3b* and *4a*. Genital opening square, 41–46 µm long, 40–48 µm wide, typically bearing 3 pairs of setae. Aggenital setae absent. Two points of black pigment (“insertion tendineuse ( $\beta$ )” of Grandjean (1968)) adjacent to anterior corners of genital opening. Anal aperture waterdrop-shaped, 59–61 µm long, 46–51 µm wide. One pair of anal setae and 3 pairs of adanal setae. Adanal setae  $ad_1$  and  $ad_2$  located posteriorly of anal opening. Setae of anogenital region fine and inconspicuous or reduced to alveoli. Conspicuous carina running along posterior edge of anal opening. Adanal fissures *iad* situated adjacent to posterolateral rim of anal opening. Dark brown preanal organ conspicuous.

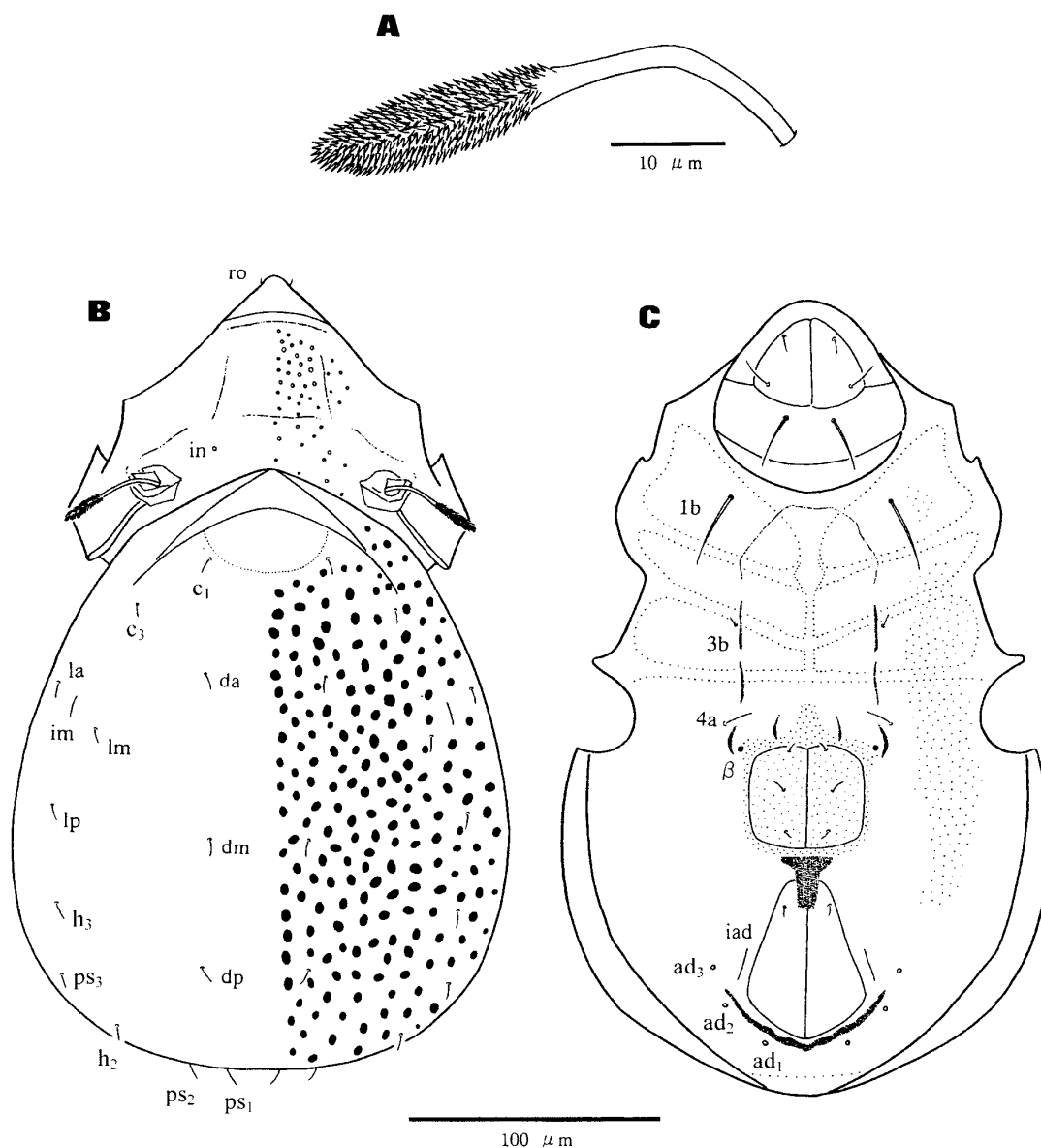


Fig. 1. *Arotrobates granulatus* Luxton, 1992 from the Ryukyus. A, Sensillus; B, dorsal side of body; C, ventral side of body.

**Legs.** Lengths of femur, genu, tibia, tarsus, and claw as follows (in  $\mu\text{m}$ ;  $n=1$ ): leg I 67, 15, 33, 35, 32; leg II 59, 12, 32, 36, 24; leg III 49, 10, 32, 33, 24; leg IV 50, 11, 41, 35, 28. All legs heavily pigmented, appearing dark brown, in parts, monodactyl, with claws smooth.

**Remarks.** *Arotrobates granulatus* was described by Luxton (1992) from the marine littoral of Hong Kong. Setae  $h_1$  were not seen in the specimens from the Ryukyus, while the specimens from Hong Kong have these setae. Setae  $la$ ,  $lm$ , and  $lp$  of the specimens from Hong Kong are situated all in a row, while setae  $lm$  of the specimens from the Ryukyus are situated mediad of the line between  $la$  and  $lp$ .

Genus ***Rhizophobates*** gen. nov.  
[Japanese name: Hirugi-norodani-zoku]

Type species: *Rhizophobates shimojanai* sp. nov.

Additional species: *Rhizophobates ugraseni* (Marshall and Pugh, 2000), **comb. nov.**; *Rhizophobates melanomerus* (Marshall and Pugh, 2000), **comb. nov.**

**Diagnosis.** Body surface densely granulate. Notogaster broadly rounded. Dorsosejugal suture interrupted medially. Sensilli clavate, with capitulum densely barbed. Interlamellar ridges indistinct. Epimeral chaetotaxy 1-0-1-1. Anogenital chaetotaxy 3-0-2-3. Adanal fissures (*iad*) aligned obliquely or longitudinally, but not horizontally. Legs each bearing long single claw with ventroproximal tooth.

**Remarks.** The related genus *Schusteria* differs from the new genus by having (1) distinct interlamellar ridges, (2) an anal aperture with only one pair of setae, (3) the adanal fissures aligned horizontally, and (4) the body surface glabrous or sparsely covered by granules.

Marshall and Pugh (2000) described two species as new, which they assigned to the genus *Schusteria*, but we consider it appropriate to include them in the new genus proposed here by us. Both species have the characters of the new genus: body surface densely granulate, interlamellar ridges indistinct, anal setae in two pairs, and adanal fissures (*iad*) aligned obliquely or longitudinally.

**Etymology.** The generic name *Rhizophobates* is derived from a plant family name Rhizophoraceae, predominant trees among mangrove forests in the Ryukyus, and a Greek noun *bates* (walker); gender masculine.

***Rhizophobates shimojanai*** sp. nov.  
[Japanese name: Shimojana-norodani]  
(Fig. 2A–F)

**Specimens examined.** Holotype: ♂, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 22-I-2003, S. Karasawa leg., from algae on floor of mangrove forest. Paratypes: 2♂ 1♀, same data as holotype; 1♂ 2♀ 2 sex unknown, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 1-VIII-2002, S. Karasawa leg., from algae on knee roots of *Bruguiera gymnorhiza*; 1♀, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 16-IV-2002, S. Karasawa leg., from knee roots of *B. gymnorhiza*. The holotype (NSMT-Ac 11647) and four paratypes (NSMT-Ac 11648–11651) are deposited in the National Science Museum, Tokyo, and three paratypes (RUMF-ZA 01003–01005) in the University Museum, University of the Ryukyus, Okinawa.

**Etymology.** The specific name is dedicated to Dr Matsuei Shimojana, a renowned biologist, who greatly contributed to the study of the arachnid fauna of Okinawa.

**Measurements.** Body length of male 366–374 µm, notogastral width 244–262 µm (n=3); body length of female 363–388 µm, notogastral width 265–270 µm (n=2).

**Description.** *Prodorsum.* Prodorsal surface densely granulate. Rostral tip weakly pointed, with hyaline marginal rim; dorsal side of rostrum with pair of small apophyses for rostral setae, weak transverse ridge behind them, and strong posterior ridge extending posteriorly to level of bothridia. Rostral setae minute,

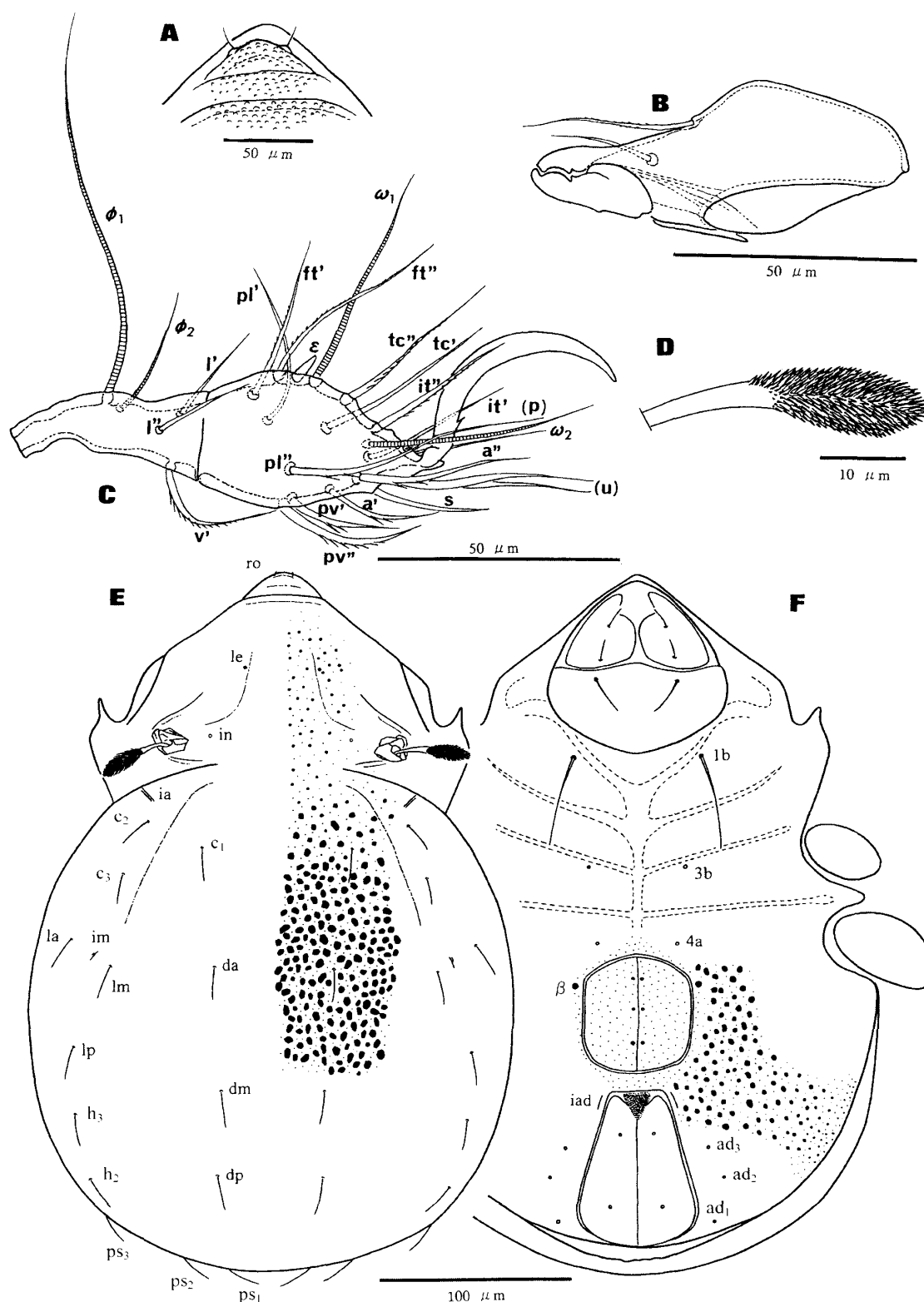


Fig. 2. *Rhizophobates shimojanai* gen. nov. and sp. nov. A, Rostrum (paratype NSMT-Ac 11649); B, chelicera (paratype NSMT-Ac 11650); C, tarsus and tibia of leg I, antiaxial side (paratype NSMT-Ac 11649); D, sensillus (holotype); E, dorsal side of body (holotype); F, ventral side of body (holotype).

4–6  $\mu\text{m}$  long, hardly visible. Lamellar and interlamellar setae discernible only by their setal pores. Ratio of mutual distances *ro-ro*: *le-le*: *in-in* = 1.0: 3.5: 7.0. No lamellar ridges, but pair of short curved lines in front of bothridia. Bothridia widely separated (91–104  $\mu\text{m}$ ). Sensillus bearing short peduncle and club-shaped head densely set with barbs.

*Notogaster*. Broadly rounded, slightly longer than wide, length/width 1.08–1.10. Notogastral surface covered densely with granules of different sizes. Dorsosejugal suture interrupted medially. Fourteen pairs of notogastral setae very fine, 15–20  $\mu\text{m}$  long, hardly visible except for *p*-series.

*Ventral side*. Ventral surface densely granulate except on hypostome, epimeron I, and median part of epimeron III. Setal formula of epimera 1-0-1-1; setae *1b* markedly long (43–56  $\mu\text{m}$ ), reaching posteriorly of *apo. sj.*, while setae *3b* and *4a* only discernible by their setal pores. Genital aperture nearly as long as wide (56–65  $\mu\text{m}$  long, 55–65  $\mu\text{m}$  wide), with 3 pairs of setae arranged very close to median margin of plate. Anal aperture pear-shaped, 81–93  $\mu\text{m}$  long, 63–69  $\mu\text{m}$  wide, with 2 widely separated pairs of setae. Preanal organ large and triangular. Adanal fissures *iad* located close to anterolateral corners of anal opening. Three pairs of adanal setae inserted lateral to anal opening, fairly distant from anal margin.

*Legs*. Chaetotaxy (Tr-Fe-Ge-Ti-Ta, solenidia and famulus included) of leg I 0-3-2-5-19, leg II 0-3-2-3-15, leg III 0-2-2-3-13, and leg IV 0-2-1-3-12. Solenidiotaxy of leg I 1-2-2, leg II 1-1-2, leg III 1-1-1, and leg IV 0-1-0. Seta  $\epsilon$  short, located between *ft'* and  $\omega_1$ . Solenidion  $\omega_2$  on tarsus I inserted far anteriorly, distant from  $\omega_1$ . Famulus on tarsus I thick and bud-like. Lengths of femur, genu, tibia, tarsus, and claw as follows (in  $\mu\text{m}$ ; *n*=1): leg I 92, 17, 40, 46, 40; leg II 93, 22, 36, 42, 33; leg III 54, 13, 37, 39, 32; leg IV 80, 15, 46, 44, 44. All legs with long single claw, this provided with small tooth on ventroproximal part.

Genus *Schusteria* Grandjean, 1968  
[Japanese name: Nagisa-norodani-zoku]

Type species: *Schusteria littorea* Grandjean, 1968.

*Schusteria nagisa* sp. nov.  
[Japanese name: Nagisa-norodani]  
(Fig. 3A–D)

**Specimens examined.** Holotype: ♀, Uka, Kunigami Vil., Okinawa Is., Okinawa Pref., 13-VIII-2002, S. Karasawa leg., from algae on rocks in littoral zone. Paratypes: 1♂ 3♀, same data as holotype. The holotype (NSMT-Ac 11652) and two paratypes (NSMT-Ac 11653, 11654) are deposited in the National Science Museum, Tokyo, and one paratype (RUMF-ZA 01006) in the University Museum, University of the Ryukyus, Okinawa.

**Etymology.** The specific name “nagisa” is a Japanese word meaning “the littoral zone”, the habitat of the species; noun in apposition.

**Measurements.** Body length of male 337  $\mu\text{m}$ , notogastral width 222  $\mu\text{m}$  (*n*=1); body length of female 360–365  $\mu\text{m}$ , notogastral width 244–246  $\mu\text{m}$  (*n*=3).

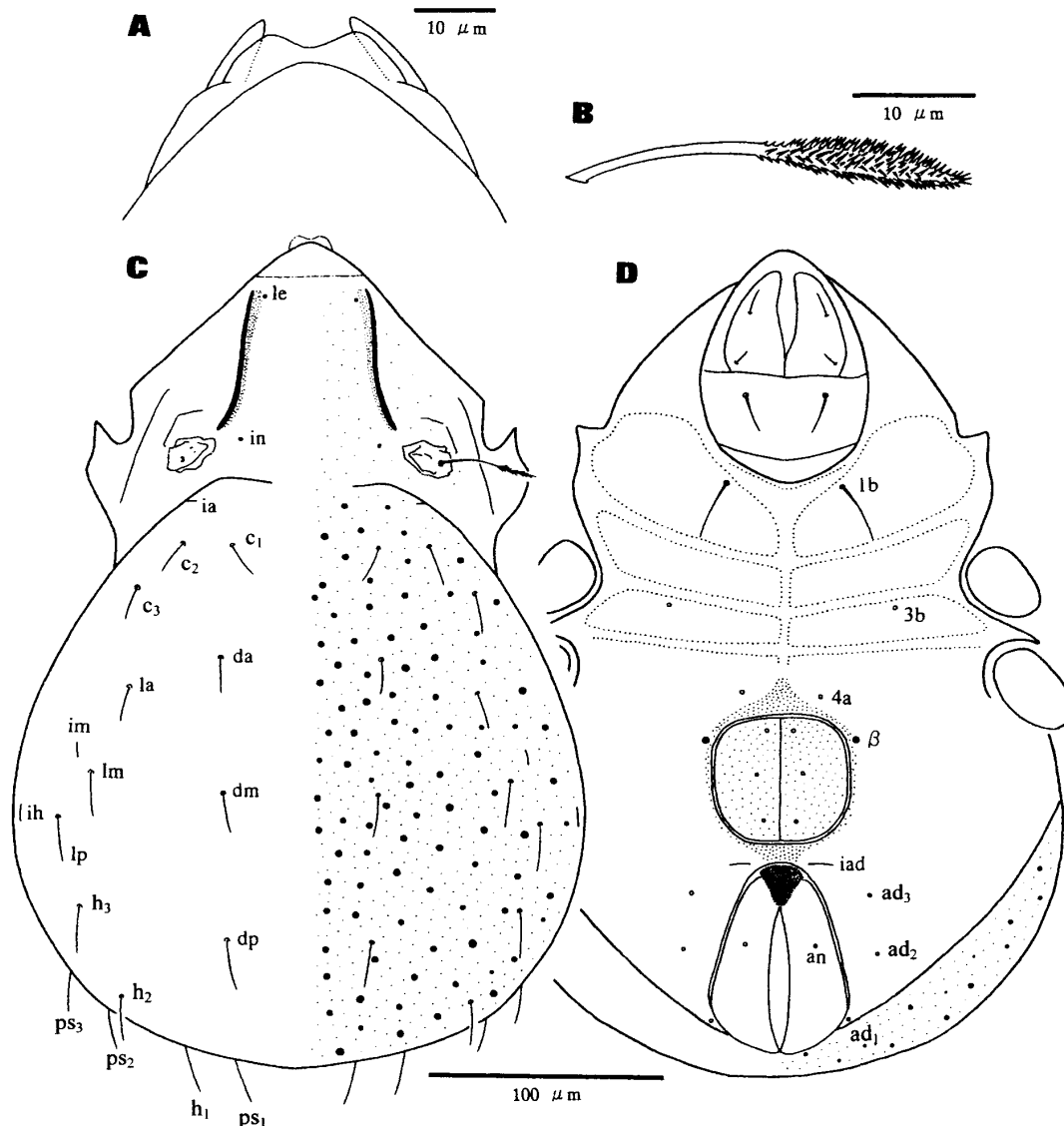


Fig. 3. *Schusteria nagisa* sp. nov., holotype. A, Rostrum; B, sensillus; C, dorsal side of body; D, ventral side of body.

**Description.** *Prodorsum.* Minute granules randomly and sparsely distributed on surface. Rostrum rounded, demarcated from rest of prodorsum by faint transverse ridge, tip with 2 convex knobs and pair of blade-like structures. Rostral setae not seen. Pair of distinct ridges running longitudinally on prodorsum, slightly converging anteriorly. Interlamellar and lamellar setae minute or reduced to alveoli. Bothridium conspicuous and dark with carina inclined medially. In outer margin of bothridium, carina running diagonally. Mutual distances (in μm) of *le-le*, *in-in*, *Bo-Bo* 39–44, 56–65, 69–81, respectively. Sensillus lanceolate, capitulum densely barbed.

*Notogaster.* Widest part found rather posteriorly. Notogastral surface covered with small and large granules. Dorsosejugal suture incomplete, interrupted medially. Fifteen pairs of fine notogastral setae in 17–28 μm long. Mutual distances (in

$\mu\text{m}$ ) of  $c_1$ – $c_1$ ,  $da$ – $da$ ,  $dm$ – $dm$ ,  $dp$ – $dp$  56–61, 65–70, 64–65, 59–60, respectively. Notogastral lyrifissures *im* located between setae *la* and *lm*.

**Ventral side.** Overall surface smooth. Setal formula of epimera 1-0-1-1; setae on epimeron I especially long (26–31  $\mu\text{m}$ ), those on III and IV reduced to alveoli. Genital opening square, 52–61  $\mu\text{m}$  long, 54–67  $\mu\text{m}$  wide, surrounded by dark-colored area. Point of black pigment ( $\beta$ ) adjacent to each anterior corner of genital opening. Anal opening waterdrop-shaped, 80–83  $\mu\text{m}$  long, 57–65  $\mu\text{m}$  wide. Genital setae in 3 pairs, anal setae in 1 pair, aggenital setae absent, and adanal setae in 3 pairs. Setae of anogenital region inconspicuous or reduced to alveoli. Adanal setae  $ad_3$  situated anterior to anal setae *an*. Adanal lyrifissures *iad* placed horizontally, situated close to anterior margin of anal opening. Preanal organ tongue-shaped, conspicuous and dark.

**Legs.** Lengths of femur, genu, tibia, tarsus, and claw as follows (in  $\mu\text{m}$ ;  $n=1$ ): leg I 107, 17, 48, 48, 37; leg II 80, 17, 37, 44, 33; leg III 59, 14, 143, 37, 31; leg IV 81, 15, 52, 43, 39. All legs heavily pigmented, appearing dark brown, in parts, monodactyl, each claw with tiny dorsal tooth.

***Schusteria saxea* sp. nov.**

[Japanese name: Nisenagisa-norodani]

(Fig. 4A–D)

**Specimens examined.** Holotype: ♂, Uka, Kunigami Vil., Okinawa Is., Okinawa Pref., 24-I-2003, S. Karasawa leg., from algae on rocks in littoral zone. Paratypes: 2♀, same data as holotype; 1♀, Hoshizuna-no-hama, Iriomote Is., Okinawa Pref., 24-VIII-2002, S. Karasawa leg., from algae on rocks in littoral zone. The type series is deposited as follows: holotype (NSMT-Ac 11655) and two paratypes (NSMT-Ac 11656, 11657) in the National Science Museum, Tokyo; one paratype (RUMF-ZA 01007) in the University Museum, University of the Ryukyus, Okinawa.

**Etymology.** The specific name, from the Latin adjective “saxeus” meaning “of stone”, refers to the rocky-shore habitat of the species.

**Measurements.** Body length of male 340–365  $\mu\text{m}$ , notogastral width 231–240  $\mu\text{m}$  ( $n=2$ ); body length of female 362–366  $\mu\text{m}$ , notogastral width 240  $\mu\text{m}$  ( $n=2$ ).

**Description.** *Prodorsum.* Small and minute granules randomly and sparsely distributed on surface. Rostrum rounded, demarcated from rest of prodorsum by transverse ridge, with trapezoidal anterior rim. Rostral setae minute or invisible. Pair of faint ridges running longitudinally on prodorsum, converging anteriorly. Interlamellar setae minute, around 3  $\mu\text{m}$  long, lamellar setae minute (around 5  $\mu\text{m}$ ) or reduced to alveoli. Bothridium conspicuous and dark. Mutual distances (in  $\mu\text{m}$ ) of *le*–*le*, *in*–*in*, *Bo*–*Bo* 41, 55–56, 70–78, respectively. Sensillus weakly thickened distally, with short barbs.

*Notogaster.* Notogastral surface covered with small and large granules. Dorsosejugal suture complete and concave medially, or incomplete. Posterior end of notogaster projecting. Notogastral setae fine, in 15 pairs, 11–22  $\mu\text{m}$  long. Notogastral lyrifissures *im* situated between setae *la* and *lm*.

**Ventral side.** Overall surface smooth. Setal formula of epimera 1-0-1-1; setae *1b* especially long (19–24  $\mu\text{m}$ ), *3b* very short, and *4a* reduced to alveoli. Genital and anal openings large, 49–56  $\mu\text{m}$  long, 50–60  $\mu\text{m}$  wide, and 78–85  $\mu\text{m}$  long, around



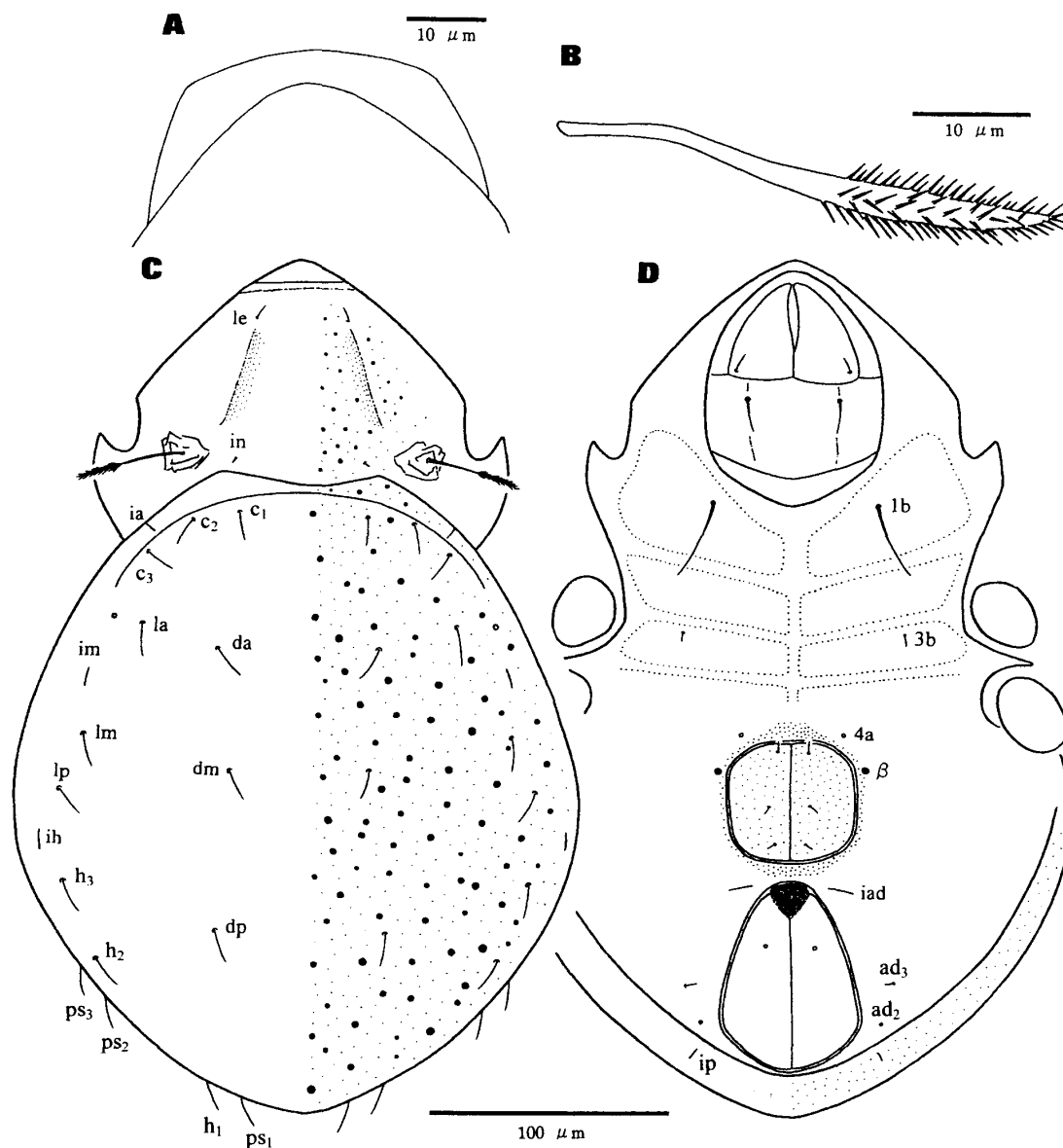


Fig. 4. *Schusteria saxea* sp. nov. A, Rostrum (paratype NSMT-Ac 11656); B, sensillus (holotype); C, dorsal side of body (holotype); D, ventral side of body (holotype).

60 μm wide, respectively, and close together. Area around genital openings dark-colored. Point of black pigment (β) adjacent to each anterior corner of genital opening. Genital setae in 3 pairs, anal setae in 1 pair, aggenital setae absent, and adanal setae in 2 pairs;  $ad_1$  absent. Setae of anogenital region inconspicuous or reduced to alveoli. Adanal setae  $ad_3$  situated posterior to anal setae *an*. Adanal lyrifissures *iad* placed horizontally, close to anterior margin of anal opening.

**Legs.** Lengths of femur, genu, tibia, tarsus, and claw as follows (in μm; n=1): leg I 84, 14, 41, 35, 40; leg II 69, 12, 32, 37, 33; leg III 59, 12, 39, 36, 37; leg IV 74, 13, 48, 37, 40. All legs heavily pigmented, appearing dark brown, in parts, monodactyl, each claw with tiny dorsal tooth.

**Key to the species of *Schusteria* and *Rhizophobates* of the world**

1. Anal plate with 1 seta; prodorsum bearing pair of longitudinal ridges; granules on body surface sparse or absent; adanal fissures (*iad*) aligned horizontally .....genus *Schusteria*.....2
- Anal plate with 2 setae; prodorsum lacking pair of longitudinal ridges; granules on body surface dense; adanal fissure (*iad*) aligned longitudinally or obliquely, situated close to anal margin.....genus *Rhizophobates* gen. nov.....4
2. Adanal setae in 2 pairs (*ad*<sub>1</sub> absent); setae *ad*<sub>2</sub> inserted at level posterior to *an*<sub>2</sub>; posterior end of notogaster weakly pointed .....*Schusteria saxea* sp. nov.
- Adanal setae in 3 pairs (*ad*<sub>1</sub> present); setae *ad*<sub>2</sub> inserted at level anterior to *an*<sub>2</sub>; posterior end of notogaster broadly rounded.....3
3. Rostrum with appendage of complicated shape; prodorsal ridges strongly developed; sensillus weakly thickened distally, with short barbs.....*Schusteria nagisa* sp. nov.
- Rostrum with no appendage of complicated shape; prodorsal ridges weakly developed; sensillus with short stem and clavate head: known from Brazil .....*Schusteria littorea*
4. Adanal setae in 3 pairs; sensillus with short stem; genital setae inserted very close to median margin of genital plate.....*Rhizophobates shimojanai* sp. nov.
- Adanal setae in 2 pairs; sensillus with long stem; genital setae inserted separately from median margin of genital plate .....5
5. Notogaster with 14 pairs of setae; adanal fissures obliquely aligned: setae *an*<sub>1</sub> very close to posterior end of anal plate: known from South Africa .....*Rhizophobates ugraseni*
- Notogaster with 15 pairs of setae; adanal fissures longitudinally aligned; setae *an*<sub>1</sub> distant from end of anal plate: known from Mozambique .....*Rhizophobates melanomerus*

Family **Fortuyniidae** Hammen, 1963

[Japanese name: Umi-norodani-ka]

Genus ***Alismobates*** Luxton, 1992

[Japanese name: Hamabe-norodani-zoku]

Type species: *Alismobates reticulatus* Luxton, 1992.***Alismobates reticulatus*** Luxton, 1992

[Japanese name: Hamabe-norodani]

(Fig. 5A–D)

*Alismobates reticulatus* Luxton, 1992: 223, figs 8A–B, 9.

**Specimens examined.** Two♂, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 21-X-2001, S. Karasawa leg., from bark of *Bruguiera gymnorrhiza* 0–50 cm above ground; 1♀, Funaura Bay, Iriomote Is., Okinawa Pref., 30-X-2001, S. Karasawa leg., from bark of knee root of *B. gymnorrhiza*; 1♂, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 16-IV-2002, S. Karasawa leg., from algae on floor

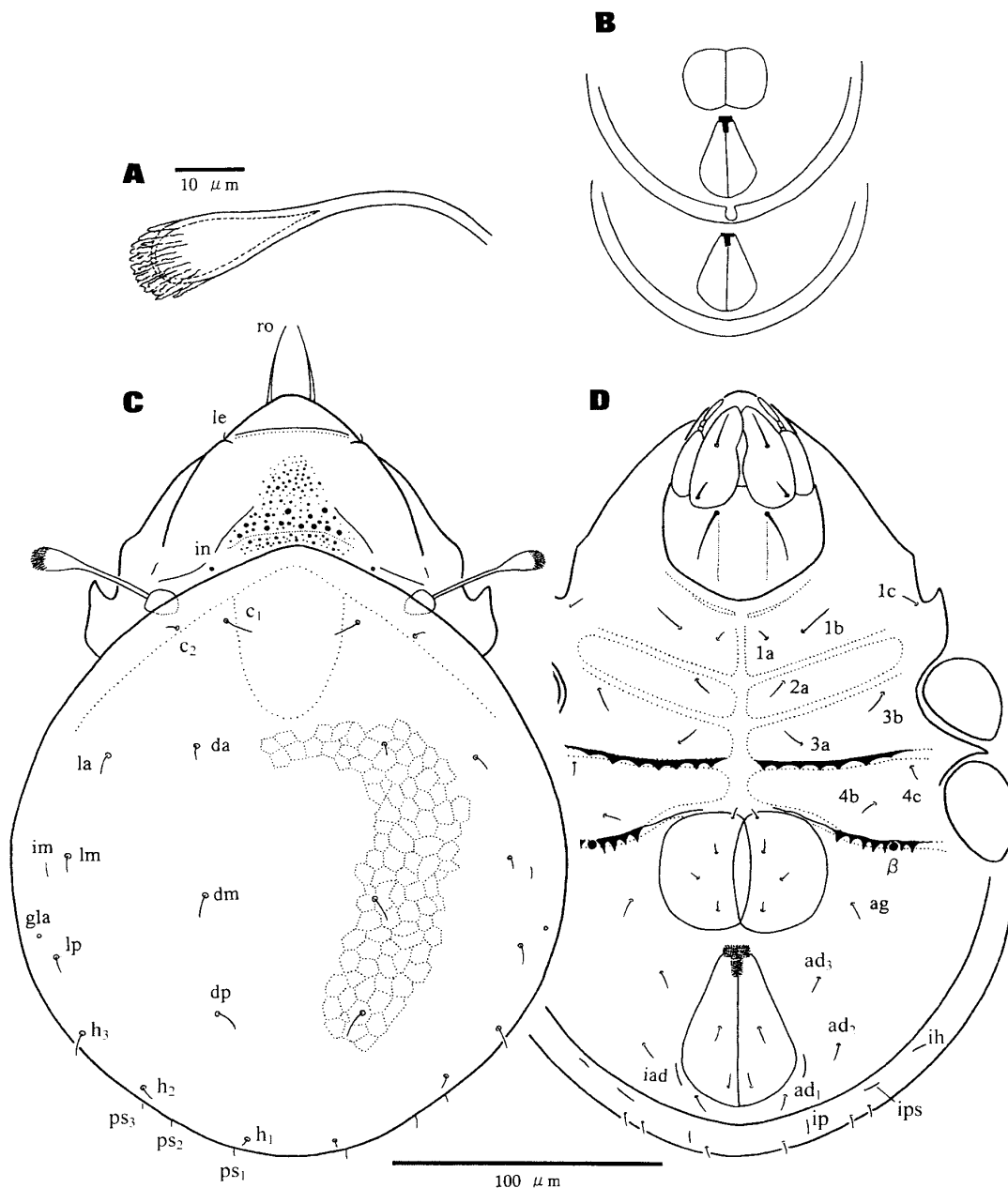


Fig. 5. *Alismobates reticulatus* Luxton, 1992 from the Ryukyus. A, Sensillus; B, morphological variation in posterior end of notogaster; C, dorsal side of body; D, ventral side of body.

of mangrove forest; 2♂ 3♀, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 1-VIII-2002, S. Karasawa leg., from algae on knee root of *B. gymnorrhiza* 0–50 cm above ground; 1♂ 1♀, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 22-I-2003, S. Karasawa leg., from algae on floor of mangrove forest. All specimens (RUMF-ZA 01008–01016) are deposited in the University Museum, University of the Ryukyus, Okinawa.

**Measurements.** Body length of male 278–295 µm, notogastral width 190–195 µm (n=3); body length of female 290–300 µm, notogastral width 200–210 µm

(n=2).

**Description.** *Prodorsum*. Rostral setae long (31–35  $\mu\text{m}$ ) and strong. Rostrum demarcated from rest of prodorsum by transverse ridge, with apophysis on each side, each apophysis bearing minute lamellar seta (6–7  $\mu\text{m}$  long). Pair of ridges converging anteriorly on central part of prodorsum, area enclosed by these ridges densely covered with small and large granules. Interlamellar setae reduced to alveoli. Sensillus clavate, capitulum covered distally with dense setulae.

*Notogaster*. Notogaster rounded. Dorsejugal suture complete, projecting medially. Lighter-colored area anteromedially. Notogaster covered with conspicuous reticulate pattern. Notogastral setae in 14 pairs, very fine and inconspicuous, less than 17  $\mu\text{m}$  long, but their alveoli conspicuous. Setae *la* located level with or posterior to *da*. Distance  $c_1$ – $c_1$  greater than that of  $c_1$ – $c_2$ . Lyrifissures *im* adjacent to setae *lm*. Gland opening *gla* situated between setae *lm* and *lp*.

*Ventral side*. Ventroposterior margin of notogaster smoothly rounded or with distinct hollow (Fig. 5B). Setal formula of epimera 3-1-2-2; *1c* inconspicuous. Lengths of epimeral setae 7–17  $\mu\text{m}$ . Series of sclerotized teeth running along apodemes III and IV. Point of black pigment ( $\beta$ ) on epimeron IV on each side. Genital opening large (43–50  $\mu\text{m}$  long, 54–62  $\mu\text{m}$  wide) in relation to body size. Genital setae in 4 pairs, 4–10  $\mu\text{m}$  long, aggenital setae in 1 pair, 7–9  $\mu\text{m}$  long. Anal opening water-drop-shaped, 60–70  $\mu\text{m}$  long, 46–50  $\mu\text{m}$  wide. Anal setae in 2 pairs, around 7  $\mu\text{m}$  long, adanal setae in 3 pairs, 9–11  $\mu\text{m}$  long. Setae of anogenital region fine and inconspicuous. Adanal fissures *iad* between adanal setae  $ad_1$  and  $ad_2$ . Dark brown preanal organ conspicuous.

*Legs*. Lengths of femur, genu, tibia, tarsus, and claw as follows (in  $\mu\text{m}$ ; n=1): leg I 67, 13, 39, 37, 31; leg II 61, 13, 32, 33, 30; leg III 44, 13, 38, 37, 28; leg IV 63, 12, 46, 41, 33. All legs heavily pigmented, appearing dark brown in parts, monodactyl, each claw without tooth.

**Remarks.** *Alismobates reticulatus* was described by Luxton (1992) from the marine littoral of Hong Kong. The present specimens are well in accord with the original description of the species. There are, however, three differences between the specimens from the Ryukyus and those from Hong Kong. (1) Adanal setae  $ad_2$  of the former are located anterior to adanal fissures *iad* (n=11), not posterior to these fissures as in the latter (cf. Luxton 1992). (2) The distance  $c_1$ – $c_1$  of the present specimens is greater than that of  $c_1$ – $c_2$ , but the reverse is true in the specimens from Hong Kong. (3) Setae *la* of the specimens from the Ryukyus are located level with or posterior to *da*, whereas in specimens from Hong Kong they are located either anterior or posterior to *da*. We think these differences are not important enough for specific segregation.

Genus ***Fortuynia*** Hammen, 1960  
[Japanese name: Umi-norodani-zoku]

Type species: *Fortuynia marina* Hammen, 1960.

***Fortuynia rotunda*** Marshall and Pugh, 2002  
[Japanese name: Ôumi-norodani]

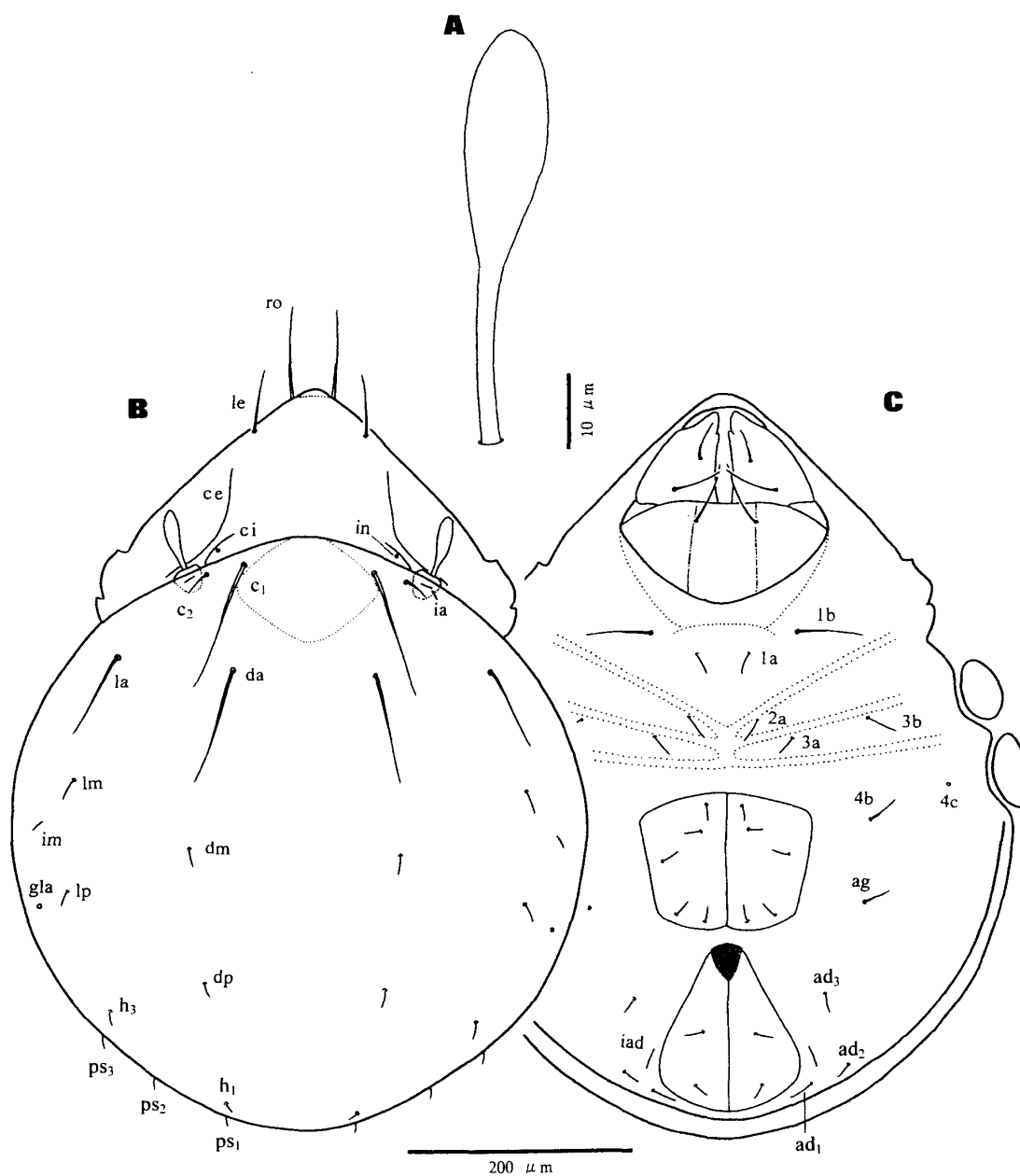


Fig. 6. *Fortuynia rotunda* Marshall and Pugh, 2000 from Okinawa Is. A, Sensillus; B, dorsal side of body; C, ventral side of body.

(Fig. 6A–C)

*Fortuynia rotunda* Marshall and Pugh, 2002: 176, figs 3–4.

*Fortuynia marina*: Karasawa and Hijii 2004: 248, 251, table 2. [Not *F. marina* Hammen, 1960]

**Specimens examined.** Two ♂, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 11-X-2001, S. Karasawa leg., from algae on floor of mangrove forest; 4♂ 4♀, Okukubi River, Kin Town, Okinawa Is., Okinawa Pref., 22-I-2003, S. Karasawa

Table 1. Comparison of differential characters between related species of the genus *Fortuynia*.

	<i>F. marina</i> *	<i>F. rotunda</i> *	<i>F. rotunda</i>
Locality	New Guinea	Mozambique	Japan
L/W of notogaster	1.17	1.07	1.07
$c_3$ (vestiges)	present	absent	absent
<i>la</i> location	anterior to <i>da</i>	level with or posterior to <i>da</i>	level with <i>da</i>
<i>1b</i>	not reaching <i>1a</i>	reaching <i>1a</i>	reaching <i>1a</i>
Transverse epimeral borders I and II	well-separated on sternum	about medially on sternum	about medially on sternum
Vestige of <i>in</i> location	near base of ci	in front of ci	near base of ci
Body length ( $\mu\text{m}$ )	590	556–598	600–718
$c_1/c_2$	2.33	2.00	5.71
<i>da/da-da</i>	0.39	0.33	0.63
<i>da/lm</i>	6.50	1.98	3.75

\* Measurements are taken from Hammen (1960) and Marshall and Pugh (2002), respectively.

leg., from algae on floor of mangrove forest. All specimens (RUMF-ZA 01017–01026) are deposited in the University Museum, University of the Ryukyus, Okinawa.

**Measurements.** Body length of male 600–605  $\mu\text{m}$ , notogastral width 470–475  $\mu\text{m}$  ( $n=2$ ); body length of female 673–718  $\mu\text{m}$ , notogastral width 533–555  $\mu\text{m}$  ( $n=3$ ).

**Description.** *Prodorsum.* Surface smooth. Rostral setae smooth and long (69–93  $\mu\text{m}$ ). Lamellar setae smooth, 44–63  $\mu\text{m}$  long, interlamellar setae reduced to alveoli. Lamellar ridge absent. Sensillus smooth, thick and clavate, directed anteriorly. Internal prodorsal channel (ci) short, reaching vestige of interlamellar setae *in*, external prodorsal channel (ce) long, extending anteriorly across two-thirds of prodorsum.

*Notogaster.* Notogaster rounded, with lighter areas anteriorly. Surface smooth. Dorsosejugal suture complete. Notogastral setae in 13 pairs; setae  $c_1$ , *da*, and *la* long, other notogastral setae short. Distance  $c_1-c_1$  greater than that of  $c_1-c_2$ . Setae  $c_3$  and  $h_2$  absent and vestiges not seen. Setal length ranges as follows (in  $\mu\text{m}$ ):  $c_1$  113–130,  $c_2$  11–35, *da* 93–111, *dm* 19–23, *dp* 9–19, *la* 85–117, *lm* 24–33, *lp* 15–26,  $h_3$  11–22,  $h_1$  12–13,  $ps_3$  15–16,  $ps_2$  9–14,  $ps_1$  8–13. Lyrifissure *ia* lateral to setae  $c_2$ , lyrifissure *im* between setae *lm* and *lp*. Gland opening *gla* adjacent to setae *lp*.

*Ventral side.* Surface smooth. Setal formula of epimera 2-1-2-2; setae *1c* and *3c* not seen. Epimeral setae short (15–35  $\mu\text{m}$ ) except for *1b* (37–65  $\mu\text{m}$ ). Genital and anal plates of same color as ventral surface. Epimeral borders aggregated in front of genital aperture. Genital opening trapezoidal, 106–130  $\mu\text{m}$  long, 137–170  $\mu\text{m}$  wide, typically bearing 5 pairs of setae in 18–30  $\mu\text{m}$  long. One pair of aggenital setae (19–28  $\mu\text{m}$  long). Anal opening large, 126–159  $\mu\text{m}$  long, 120–140  $\mu\text{m}$  wide, typically bearing 2 pairs of setae in 17–18  $\mu\text{m}$  long. Preanal organ dark. Adanal setae  $ad_2$  (14–17  $\mu\text{m}$  long) level with lyrifissures *iad*. Setae  $ad_3$  15–19  $\mu\text{m}$  long, anterior to anal setae. Setae  $ad_1$  slightly longer than other adanal setae (around 22  $\mu\text{m}$ ).

*Legs.* Lengths of femur, genu, tibia, tarsus, and claw as follows (in  $\mu\text{m}$ ;  $n=1$ ): leg I 174, 32, 93, 69, 67; leg II 170, 39, 93, 74, 70; leg III 148, 24, 130, 70, 70; leg IV 178, 24, 148, 78, 74. All legs monodactyle, each claw smooth.

**Remarks.** *Fortuynia rotunda* from Japan is variable in morphology, and this variability overlaps somewhat with that of *F. marina* from New Guinea (Table 1). However, the former is distinguishable from the latter in four obvious ways: (1)  $c_3$  vestiges are not present, (2) setae *la* are not located anterior to *da*, (3) epimeral setae *lb* are long, reaching insertions of setae *la*, and (4) transverse epimeral borders I and II about medially on the sternum. Three setae  $h_2$ , *lc*, and *3c* are absent in the specimens from the Ryukyus.

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